DEGERconecter
the patented system control

PROFESSIONAL
POWER GENERATION

TOPtraker® 8.5
TOPtraker® NT
Single-axis

DEGERtraker 3000NT
DEGERtraker 5000NT
DEGERtraker 7000NT
Dual-axis

BUILDING-INTEGRATED

TOPtraker® 8.5
TOPtraker® HD
Single-axis

DEGERtraker 3000HD
DEGERtraker 5000HD
Dual-axis

HOBBY & LEISURE TIME

DEGERtraker 300EL
Dual-axis

Available at any time:
From your solar equipment retailer.

DEGERenergie
Tracking Systems

DEGERenergie GmbH
72160 Horb/Germany
info@DEGERenergie.com
www.DEGERenergie.com

date 06/2008

PRODUCT - Guide

DEGERenergie
Tracking Systems

Up to 45% more yield - possible only with the DEGERconecter.

Can you afford to do without half of the possible yield?

DEGERenergie
Tracking Systems

Your Advantages

that pay for themselves!

DEGER**conecter**
... the unique, patented control system

- Advantage through experience - since 1999
- Highest returns
- Lowest consumption - no energy-intensive computer in the background
- Highest availability (99.9%) - decentralised control with fail-safe program
- Most clever control unit - takes full advantage of snow- and eye-of-cloud effect
- Simple, easily mastered control electronics (no turning angle transmitter, relays, multiphase motors…) thus simple maintenance
- Lower cabling expenditures at large solar parks - no networking with data lines is necessary
- Poor weather situations are also used efficiently
- Only movements that immediately result in an increased yield are made
- The most effective control on large surfaces through individual controls clouds only influence the respective part of the solar park
- Highest precision through large measuring surfaces of the sensors - no loss in performance when dirty
- With a soft subsurface and use of the foundation, the DEGERconecter automatically readjusts - safety during long-term operation without inspection effort

DEGER**traker** / TOP**traker**
... the compete tracking systems

- Advantage through experience - since 1999
- Highest additional yields - DEGERtraker up to 45%, TOPtraker up to 30%
- Also suitable for desert and equatorial regions
- Lowest consumption - calculated mechanics allow the use of cost-efficient mini-DC motors
- Shortest assembly times
- TÜV tested and certified
- Passed hardest load tests of the Stuttgart Institute for Material Testing (MPA)
- Most flexible assembly system - suitable for all current modules and inverter types
- Lowest maintenance expenses
- Longest life
- 99.9% recyclable through aluminium and steel construction
- Lowest transport costs
- Best price-performance ratio
- Therefore a fast payoff

DEGER**energie**
.. Market leader for tracking systems

- Advantage through experience - since 1999
- 20,000 DEGERtrakers on the grid (status 05/2008)
- Growth rates of over 300% - since 1999
- 100 MW production capacity
- Up to 25 year warranty
- That results in safety - even in the spare parts supply

DEGERconecter Control System for the DEGERtraker

Accurate adjustment ...
The DEGER**conecter** always adjusts the solar installation to face the brightest point in the sky. It includes the entire system control.

Maximum power yield
During times of sunshine the module surface is accurately adjusted to face the sun. During times of overcast weather, the DEGER**conecter** automatically adjusts to face the point with the strongest global radiation.

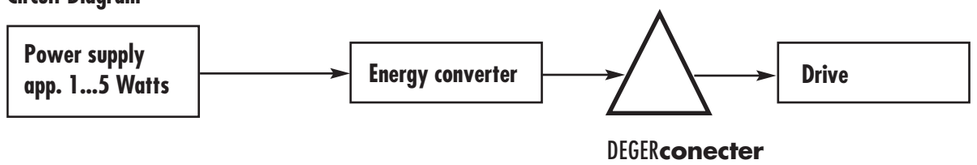
A control system to rely on.
The patented DEGER**conecter** control was distinguished with the Baden-Württemberg Prize for Innovation in 2000, has been continuously improved and has more than 40,000 units in operation.

Description of DEGERconecter functions
Two sensor cells in the DEGER**conecter** supply reference values which are evaluated by the logic device, and which provide the basis for the adjustments of the module surface in the course of the day. A third sensor cell is attached to the back of the DEGER**conecter** to reset the installation in the morning. Depending on the irradiation intensity, a differential amplifier controls the transition from the logarithmic characteristic curve during strong irradiation to a linear characteristic curve during low currents in diffuse light. That means that the logic device accepts a much higher value for the linear characteristic curve than for the logarithmic characteristic curve. This leads to improved adjustment accuracy in dim light. A load is added to the differential voltage, moving the switch-off threshold further into dusk, to ca. 30 W/m².

Drive control
The drive is controlled directly – and without requiring additional parts – by the MOSFET bridge circuit, which is integrated in the DEGER**conecter** The bridge is characterised by a very low closing resistance. To avoid overload of the motor and the DEGER**traker's** structure, a current limiter was integrated into the system. This current limiter functions dynamically, i.e. the motor is switched off as a response to overload (e.g. frozen or blocked drives). As soon as the drive works again, the system is reset automatically.

Tasks of an energy converter
The energy converter exploits wide voltage ranges of solar modules, battery systems and the grid for the DEGER**conecter**. The power for the control and drive systems may also be supplied without a battery, by direct connection to solar modules with less than one Watt power.

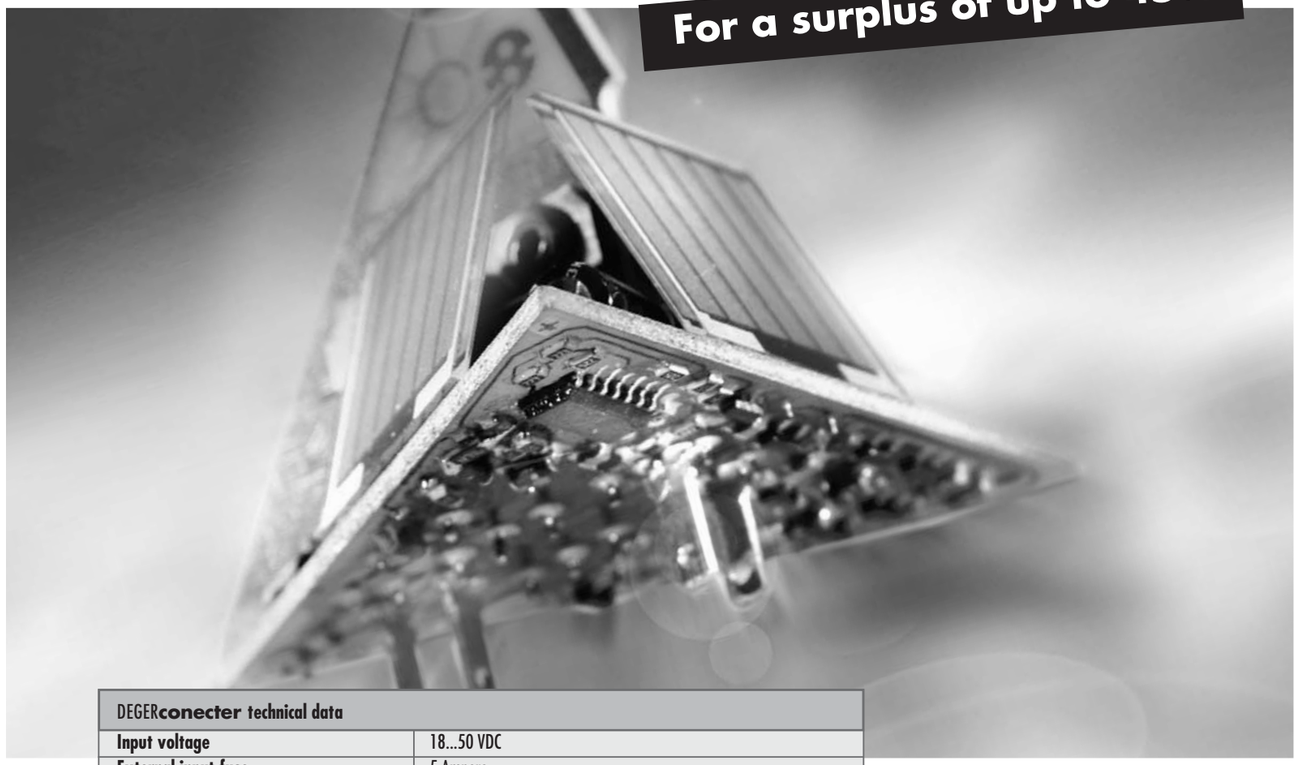
Circuit Diagram



During dawn, the DEGER**conecter** recognises the brightest spot in the sky and tries to reset the installation. The power supply module for the control system starts by producing 0.01 Watts or less, and as soon as the DEGER**conecter** attempts to control the electric motor, the voltage on the solar module breaks down. To avoid the DEGER**conecter** switching the drive on and off all the time and to achieve quick resetting, DEGER**energie** has developed the energy converter. The energy converter collects even small power inputs from the solar module (which are too small to be fed into the grid) in a high performance condenser and makes this energy available to the DEGER**conecter**. The DEGER**conecter** is thus able to reset the installation to face the brightest spot even before the modules produce enough energy to be fed into the grid. To avoid both drives from working simultaneously, the energy converter gives the east-west drive priority over elevation. The energy converter also ensures that not more than ca. 1-3 Watts is drawn from the solar module while the drive is running. The control does not use any energy during the night.

Power supply
- directly from the solar module or string,
- from a battery for stand-alone-sytems,
- from the AC grid,
- or from an additional 1-5 Wp solar module for self-powered systems.

DEGERconecter Control System for the DEGERtraker



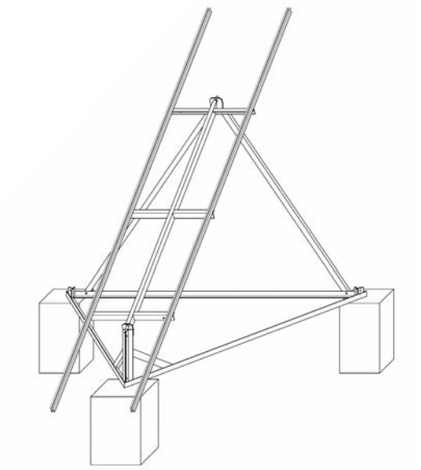
DEGER**conecter** technical data				
Input voltage	18...50 VDC			
External input fuse	5 Ampere			
Internal power consumption at night	0 Watts			
Internal power consumption control mode	max. 0.03 Watt			
Input protection	reverse polarity protection diode max. 5 A			
Output voltage	see input voltage			
Output on motor side	short-circuit proof, reverse polarity protected			
Motor protection	overload recognition, current limitation			
Switching capacity loss-free	4 Ampere			
Peak switching capacity	9 Ampere			
Adjustment accuracy in sunshine	< 1°			
Adjustment accuracy in diffuse light	< 6 %			
Measurement	edge length 80 mm			
Weight	90 gr			
Energy converter	**I**	**II**	**III**	**V**
Input voltage	9...34 VDC	24 V (20...30 VDC)	80...380 VDC oder 80...265 VAC	
Connection	independent of polarity			
Output voltage	22 VDC			
Power consumption max	3 Watts	20 Watts	5 Watts	20 Watts
Internal power consumption control mode	0.2 Watt			
Output on motor side	short-circuit proof			
Dimensions	130 x 130 x 80 mm			
Weight	440 gr	600 gr	570 gr	600 gr
Input external drive system	no	yes		

Subject to technical changes for future improvements.

Benefits
- No computer with high energy consumption required
- No rotation angle potentiometer, relay, step motors ... required
- No networking with data lines required
- The automatic drive does not contain any electromechanical parts
- Little cabling required for large solar parks
- Simple, easy-to-use control technology
- Efficient utilisation even during cloudy weather
- Only makes movements which directly lead to increased power yield.

DEGER TOP**traker**® 8.5 / NT

Single-axis, active tracking systems



DEGER TOPtraker® 8.5
with concrete foundation for open land installation

NEW!
in October 2008
TOPtraker® NT

	TOPtraker® 8.5	TOPtraker® NT
For solar energy capacity	500 ... 1,290 Wp	4,000 ... 6,400 Wp
Module area up to	8.5 m²	40 m²
Angle of inclination - south	30°	Standard 30°/ optional 0°
Elevation inclination angle	30° ... 50°	0°... 45°
Control unit	DEGER**conecter**	
Operating voltage	20 ... 40 VDC	24 (20...30V)
East - west drive	420 mm stroke path	850 mm stroke path
Internal power consumption		
control mode	0.01 Watt	
with operating drives	5 Watts	9 Watts
Power consumption per year	0.3 kWh	2.5 kWh
Mast height	––	3.3...5.5 m
Weight (excluding mast)	115 kg	510 kg
Maintenance	maintenance-free	
Geographic region	Equator ... 60° latitude	
Art.no.:	1110001	1130001

The systems are designed in accordance with DIN 1055-4 (03/2005). Project-specific assimilation to regional provisions.
Subject to technical changes for future improvements.

DEGER TOPtraker® 8.5 / NT

Single-axis, active tracking system suitable for all current solar modules

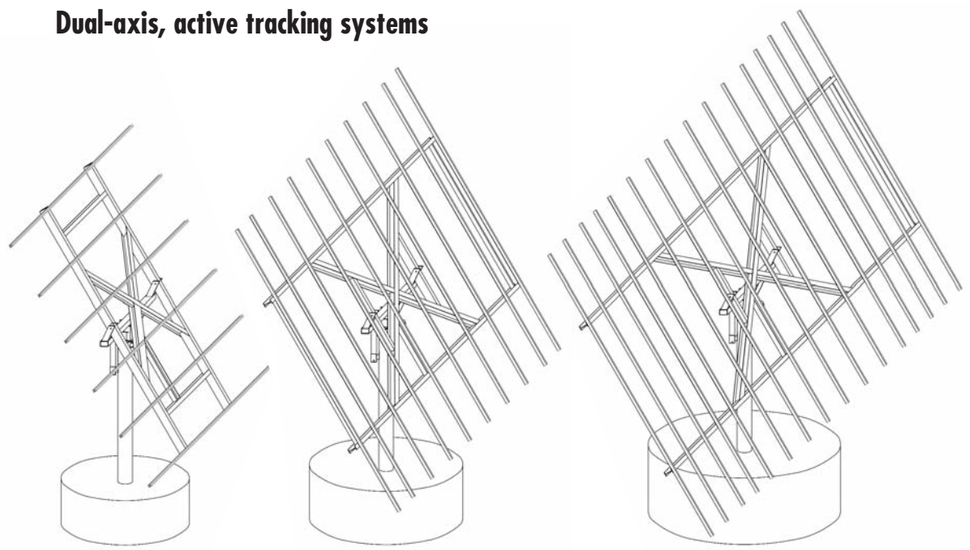
Areas of application:
- For increased performance for all photovoltaic applications.
- For open spaces and landfills.
- For all current modules.

Scope of delivery:
Complete tracking system in the optimised azimuth axis, DEGER**conecter** control electronics, module bearing system in aluminium, compatible with the module type used, installation instructions.

Professional Power Generation

DEGER**traker 3000NT / 5000NT / 7000NT**

Dual-axis, active tracking systems



DEGERtraker 3000NT **DEGERtraker 5000NT** **DEGERtraker 7000NT**

	3000NT	5000NT	7000NT
For solar energy capacity	2,000 ... 3,800 Wp	4,000 ... 6,400 Wp	6,000 ... 9,000 Wp
Module area up to	25 m²	40 m²	60 m²
Rotation angle east - west	360° with adjustable limit switches		
Elevation inclination angle	10°... 90°		
Control unit	DEGER**conecter**		
Energy converter	II or V		
East - west drive	drive integrated in the power head		
Elevation drive	1,000 mm stroke path	1,000 mm stroke path	1,100 mm stroke path
Internal power consumption:			
control mode	0.2 Watt		
with operating drives	7 Watts		9 Watts
Power consumption per year	3 kWh	3...4 kWh	3.5...4.5 kWh
Mast height	3.3...5.5 m		
Weight (excluding mast)	480 kg	550 kg	1,090 kg
Maintenance	maintenance-free		
Geographic region	25°... 60° / optional equator to 90th degree of latitude		
Art.no.:	1300001	1500001	1700001

The systems are designed in accordance with DIN 1055-4 (03/2005). Project-specific assimilation to regional provisions.
Subject to technical changes for future improvements.

DEGERtraker
3000NT / 5000NT / 7000NT

Dual-axis, active tracking system suitable for all current solar modules

Areas of application:
- For professional power generation
- For open spaces and for installation with different mast lengths.
- For all current modules.

Scope of delivery:
Complete dual-axis tracking system, mast, aluminium solar module carrier system to fit the respective module type, DEGER**conecter** control electronics with energy converter for extremely economical operation, foundation plan, construction plan.

DEGER TOP**traker**® 8.5 / HD

Single-axis, active tracking systems

DEGER TOPtraker® 8.5
without concrete foundations for flat roof installation

NEW!
in October 2008
TOPtraker® HD

	TOPtraker® 8.5	TOPtraker® HD
For solar energy capacity	500 ... 1,290 Wp	2,000 ... 3,800 Wp
Module area up to	8.5 m²	25 m²
Angle of inclination - south	30°	Standard 30°/ optional 0°
Elevation inclination angle	30° ... 50°	0°... 45°
Control unit	DEGER**conecter**	
Operating voltage	20 ... 40 VDC	24 (20 ... 30V)
East - west drive	420 mm stroke path	850 mm stroke path
Internal power consumption:		
control mode	0.01 Watt	
with operating drives	5 Watts	7 Watts
Power consumption per year	0.3 kWh	2 kWh
Mast height	––	3.3 ... 5.5 m
Weight (excluding mast)	115 kg	430 kg
Maintenance	maintenance-freei	
Geographic region	Equator…60° latitude	
Art.no.:	1110001	1120001

The systems are designed in accordance with DIN 1055-4 (03/2005). Project-specific assimilation to regional provisions.
Subject to technical changes for future improvements.

DEGER TOPtraker® 8.5 / HD

Single-axis, active tracking systems suitable for all current solar modules

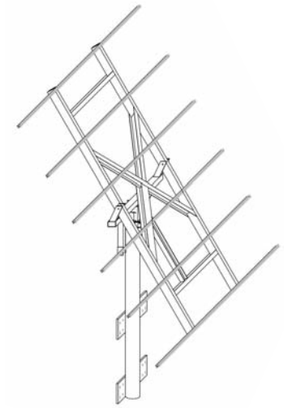
Areas of application:
- For increased performance for all photovoltaic applications.
- For flat roofs, landfills and buildings.
- For all current modules.

Scope of delivery:
Complete tracking system in the optimised azimuth axis, DEGER**conecter** control electronics, mast for TOPtraker HD, module bearing system in aluminium, compatible with the module type used, installation instructions.

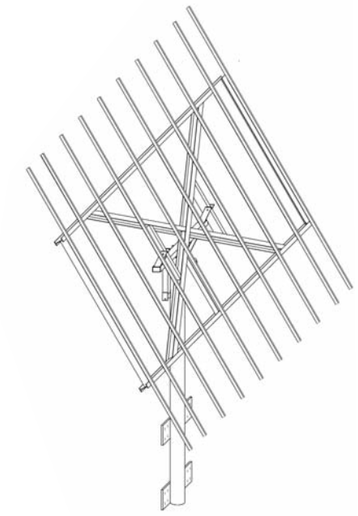
Building Integration

DEGER**traker 3000HD / 5000HD**

Dual-axis, active tracking systems



DEGERtraker 3000HD



DEGERtraker 5000HD

	3000HD	5000HD
For solar energy capacity	2,000 ... 3,800 Wp	4,000 ... 6,400 Wp
Module area up to	25 m²	40 m²
Rotation angle east - west	360° with adjustable limit switches	
Elevation inclination angle	20°... 90°	
Control unit	DEGER**conecter**	
Energy converter	II or V	
East - west drive	drive integrated in the power head	
Elevation drive	1,000 mm stroke path	1,100 mm stroke path
Internal power consumption:		
control mode	0.2 Watt	
with operating drives	7 Watts	
Power consumption per year	3 kWh	3... 4 kWh
Mast height	3.3... 5.5 m	
Weight (excluding mast)	500 kg	850 kg
Maintenance	maintenance-free	
Geographic region	25°... 60° / optional equator to 90th degree of latitude	
Art.no.:	1310001	1510001

The systems are designed in accordance with DIN 1055-4 (03/2005). Project-specific assimilation to regional provisions.
Subject to technical changes for future improvements.

DEGERtraker 3000HD / 5000HD

Dual-axis, active tracking systems suitable for all current solar modules

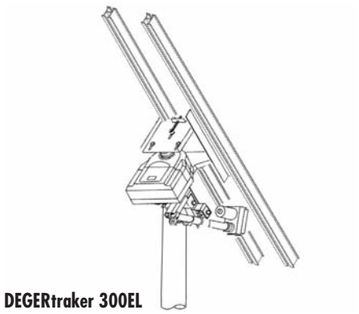
Areas of application:
- For professional power generation
- For buildings and for installation with different mast lengths.
- For all current modules.

Scope of delivery:
Complete dual-axis tracking system, mast, aluminium solar module carrier system to fit the respective module type, DEGER**conecter** control electronics with energy converter for extremely economical operation, construction plan.

Hobby & Leisure Time

DEGER**traker 300EL**

Dual-axis, active tracking system



DEGERtraker 300EL

	300EL
For solar yield	100 - 400 Wp
Module area up to	3 m²
Rotation angle east-west	200°
Elevation inclination angle	15°... 90°
Control unit	DEGER**conecter**
Energy converter	I or III
East - west drive	drive integrated in the power head
Elevation drive	linear drive, 200 mm stroke path
Internal power consumption:	
control mode	0.2 Watt
during drive operation	2 Watts
Power consumption per year	1 kWh
Mast length	mast not included, Ø 90mm
Weight (without mast)	30 kg
Maintenance	maintenance-free
Geographic regions	25th ... 60th degree of latitude
Art.no.:	1030001

Project-specific assimilation to regional provisions.
Subject to technical changes for future improvements.

DEGERtraker 300EL
for hobby and leisure time

Areas of application:
- in open spaces and on buildings.
- for installation with different mast lengths.
- For all current modules.

Scope of delivery:
Complete dual-axis tracking system, aluminium solar module carrier system to fit the respective module type, DEGER**conecter** control electronics with energy converter for extremely economical operation, construction plan.

Operating efficiency ...

in the example of a 100 kWp system with DEGERtrakers rigid systems in one area, providing approx. 1,300 kWh / kWp per year.

Rigid system yield in 20 yrs:	2.600.000 kWh at 35 ct/kWh	= €	910.000,-
DEGER**traker** yield in 20 yrs:	3.640.000 kWh at 35 ct/kWh	= €	1.274.000,-
	Profit	= €	**364.000,-**
	Higher purchase price of DEGER**traker** vs. rigid approx.	= €	60.000,-
	End profit	= €	**304.000,-**

DEGERtraker and look forward to your electricity bill

DEGER**energie**
Tracking Systems